[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No.FAA-2014-0100; Notice No. 25-557-SC]

Special Conditions: Embraer S.A., Model EMB-550 Airplane; Operation without Normal Electrical Power

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Embraer S.A. Model EMB-550 airplanes. This airplane will have a novel or unusual design feature associated with electrical and electronic systems that perform critical functions, the loss of which could be catastrophic to the airplane. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: The effective date of these special conditions is **[insert date of publication in the Federal Register].** We must receive your comments by **[insert a date 30 days after date of publication in the Federal Register].**

ADDRESSES: Send comments identified by docket number FAA-2014-0100 using any of the following methods:

- Federal eRegulations Portal: Go to http://www.regulations.gov/ and follow the online instructions for sending your comments electronically.

- Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.
- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to http://www.regulations.gov/, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the *Federal Register* published on April 11, 2000 (65 FR 19477-19478), as well as at http://DocketsInfo.dot.gov/.

Docket: Background documents or comments received may be read at http://www.regulations.gov/ at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.

FOR FURTHER INFORMATION CONTACT: Stephen Slotte, FAA, Airplane and Flight Crew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone 425-227-2315; facsimile 425-227-1149.

SUPPLEMENTARY INFORMATION:

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected aircraft. In addition, the substance of these special conditions has been subject to the public comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the *Federal Register*.

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive on or before the closing date for comments. We may change these special conditions based on the comments we receive.

Background

On May 14, 2009, Embraer S.A. applied for a type certificate for its new Model EMB-550 airplane. The Model EMB-550 airplane is the first of a new family of jet airplanes designed for corporate flight, fractional, charter, and private owner operations. The airplane has a configuration with low wing and T-tail empennage. The primary structure is metal with composite empennage and control surfaces. The Model EMB-550 airplane is designed for eight (8) passengers, with a maximum of twelve (12) passengers. It is equipped with two Honeywell AS907-3-1E medium bypass ratio turbofan engines mounted on aft fuselage pylons. Each engine produces approximately 6,540 pounds of thrust for normal takeoff.

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, Embraer S.A. must show that the Model EMB-550 meets the applicable provisions of part 25 as amended through Amendments 25-1 through 25-127 thereto.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model EMB-550 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, the special conditions would also apply to the other model.

In addition to the applicable airworthiness regulations and special conditions, the Model EMB-550 airplane must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36, and the FAA must issue a finding of regulatory adequacy under section 611 of Public Law 92 574, the "Noise Control Act of 1972."

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Model EMB-550 airplane will incorporate the following novel or unusual design feature: Electrical and electronic systems that perform critical functions. Examples of these systems include the electronic displays, electronic flight controls, and electronic engine controls.

The applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Discussion

The Model EMB-550 incorporates an electronic flight control system that requires a continuous source of electrical power in order to keep the system operable. The criticality of this system is such that its failure will either reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions, or prevent continued safe flight and landing of the airplane. The airworthiness standards of part 25 do not contain adequate or appropriate standards for protection of these systems from the adverse effects of operation without normal electrical power.

The current rule, § 25.1351(d), Amendment 25-72, requires safe operation under visual flight rules (VFR) conditions for at least five minutes after loss of all normal electrical power. This rule was structured around traditional airplane designs that used mechanical control cables and linkages for flight control. These manual controls allowed the crew to maintain aerodynamic control of the airplane for an indefinite period of time after loss of all electrical power. Under these conditions, the mechanical flight control system provided the crew with the ability to fly the airplane while attempting to identify the cause of the electrical failure, start the engine(s) if necessary, and reestablish some of the electrical power generation capability, if possible.

To maintain the same level of safety associated with traditional designs, the Model EMB-550 must be designed for operation with the normal sources of engine and auxiliary power unit (APU)-generated electrical power inoperative. Service experience has shown that loss of all

electrical power from the airplane's engine and APU-driven generators is not extremely improbable. Thus, Embraer must demonstrate that the airplane is capable of recovering adequate primary electrical power generation for safe flight and landing.

The emergency electrical power system must be designed to supply:

1. Electrical power required for immediate safety, which must continue to operate without the need for crew action following the loss of the normal engine (which includes APU power) generator electrical power system;

2. Electrical power required for continued safe flight and landing; and

3. Electrical power required to restart the engines.

Applicability

As discussed above, these special conditions are applicable to the Embraer S.A. Model EMB-550 airplane. Should Embraer S.A. apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on one airplane model. It is not a rule of general applicability.

The substance of these special conditions has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. Therefore, because a delay would significantly affect the certification of the airplane, which is imminent, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these

special conditions upon publication in the *Federal Register*. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Embraer S.A. Model EMB-550 airplane.

Operation without Normal Electrical Power

In lieu of 14 CFR 25.1351(d) the following special conditions apply to ensure that the airplane has sufficient electrical power for continued safe flight and landing.

1. The applicant must show by test or a combination of test and analysis that the airplane is capable of continued safe flight and landing with all normal electrical power sources inoperative, as prescribed by paragraphs (1)(a) and (1)(b) below.

For purposes of these special conditions, normal sources of electrical-power generation do not include any alternate power sources such as a battery, ram-air turbine (RAT), or independent power systems such as a flight-control permanent-magnet generating system.

In showing capability for continued safe flight and landing, consideration must be given to systems capability, effects on crew workload and operating conditions, and the physiological

needs of the flightcrew and passengers for the longest diversion time for which approval is sought.

a. Common-cause failures, cascading failures, and zonal physical threats must be considered in showing compliance with this requirement.

b. The ability to restore operation of portions of the electrical-power generation and distribution system may be considered if it can be shown that unrecoverable loss of those portions of the system is extremely improbable. An alternative source of electrical power must be provided for the time required to restore the minimum electrical-power-generation capability required for safe flight and landing. Unrecoverable loss of all engines may be excluded when showing that unrecoverable loss of critical portions of the electrical system is extremely improbable. Unrecoverable loss of all engines is covered in special condition 2, below, and thus may be excluded when showing compliance with this requirement.

2. Regardless of any electrical-generation and distribution-system recovery capability shown under special condition 1, above, sufficient electrical-system capability must be provided to:

a. Allow time to descend, with all engines inoperative, at the speed that provides the best glide slope, from the maximum operating altitude to the altitude at which the soonest possible engine restart could be accomplished, and

b. Subsequently allow multiple start attempts of the engines and APU. This capability must be provided in addition to the electrical capability required by existing part 25 requirements related to operation with all engines inoperative.

3. The airplane emergency electrical-power system must be designed to supply:

a. Electrical power required for immediate safety, which must continue to operate without the need for crew action following the loss of the normal electrical power, for a duration sufficient to allow reconfiguration to provide a non-time-limited source of electrical power.

b. Electrical power required for continued safe flight and landing for the maximum diversion time.

4. If APU-generated electrical power is used in satisfying the requirements of these special conditions, and if reaching a suitable runway upon which to land is beyond the capacity of the battery systems, then the APU must be able to be started under any foreseeable flight condition prior to the depletion of the battery or the restoration of normal electrical power, whichever occurs first. Flight tests must demonstrate this capability at the most critical condition.

a. It must be shown that the APU will provide adequate electrical power for continued safe flight and landing.

b. The operating limitations section of the airplane flight manual (AFM) must incorporate non-normal procedures that direct the pilot to take appropriate actions to activate the APU after loss of normal engine-driven generated electrical power.

As a part of showing compliance with these special conditions, the tests by which loss of all normal electrical power is demonstrated must also take into account the following:

1. The failure condition should be assumed to occur during night IMC, at the most critical phase of the flight, relative to the worst possible electrical-power distribution and equipment-loads-demand condition.

2. After the un-restorable loss of normal engine generator power, the airplane-engine-restart capability must be provided and operations continued in IMC.

3. It should be demonstrated that the aircraft is capable of continued safe flight and landing. The length of time must be computed based on the maximum diversion-time capability for which the airplane is being certified. Consideration for airspeed reductions resulting from the associated failure or failures must be made.

4. The airplane must provide adequate indication of loss of normal electrical power to direct the pilot to the non-normal procedures, and the operating limitations section of the AFM must incorporate non-normal procedures that will direct the pilot to take appropriate actions.

Issued in Renton, Washington, on June 17, 2014.

Michael Kaszycki
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service

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